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June 21, 2000

VIA HAND DELIVERY

Ms. Magalie Roman Salas, Secretary
Federal Communications Commission
445 12th Street, S.W.
12th Street Lobby, Room TW-A325
Washington, D.C. 20554

Re: Notice of Oral *Ex Parte* Presentation in CC Docket No. 94-102

Dear Ms. Salas:

On Wednesday June 14, 2000, Mary Brooner, Duane Rabe, Sayfe Kiaei, Paul DeClerck, and Audrey Longhurst of Motorola, along with Tom Dombrowsky of Wiley, Rein & Fielding had a meeting with Thomas Sugrue, Jim Schlichting, Kelly Quinn, Kris Monteith, Blaise Scinto, Dan Grosh, Patrick Forster, and Martin Liebman of the Wireless Telecommunications Bureau; Ira Keltz of the Office of Engineering & Technology. Motorola also had meetings with Peter Tenhula of the Office of Commissioner Powell; Bryan Tramont of the Office of Commissioner Furchtgott-Roth; Adam Krinsky of the Office of Commissioner Tristani; and Mark Schneider of the Office of Commissioner Ness. The purpose of these meetings was to discuss Motorola's concerns surrounding the implementation of location services for wireless 911 calls. The attached slides formed the basis for these discussions. In addition, these meetings also included discussion of confidential financial and commercial information. *See* 47 CFR § 0.457.

In accordance with the Commission's rules, an original and one copy of this letter are being provided for inclusion in the relevant docket file. If you have any questions or need any additional information, please let me know.

Sincerely,

Mary E. Brooner

Mary E. Brooner
Director
Telecommunications Strategy and Regulation
Motorola Global Government Relations
1350 I St., N.W. Suite 400
Washington, D.C. 20005-3306

Attachment

cc: Peter Tenhula, Esq.
Bryan Tramont, Esq.
Adam Krinsky, Esq.
Mark Schneider, Esq.
Thomas Sugrue, Esq.
James Schlichting, Esq.
Kelly Quinn, Esq.
Kris Monteith, Esq.
Blaise Scinto, Esq.
Dan Grosh, Esq.
Patrick Forster
Ira Keltz
Martin Liebman

E-911 Location Technology Implementation of ALI Capable Handsets

Duane Rabe
Vice President
Director of Systems Architecture & Engineering

Sayfe Kiaei
Senior Member of Technical Staff
Bluetooth & GPS Platform Manager
Wireless Integration Technology Center

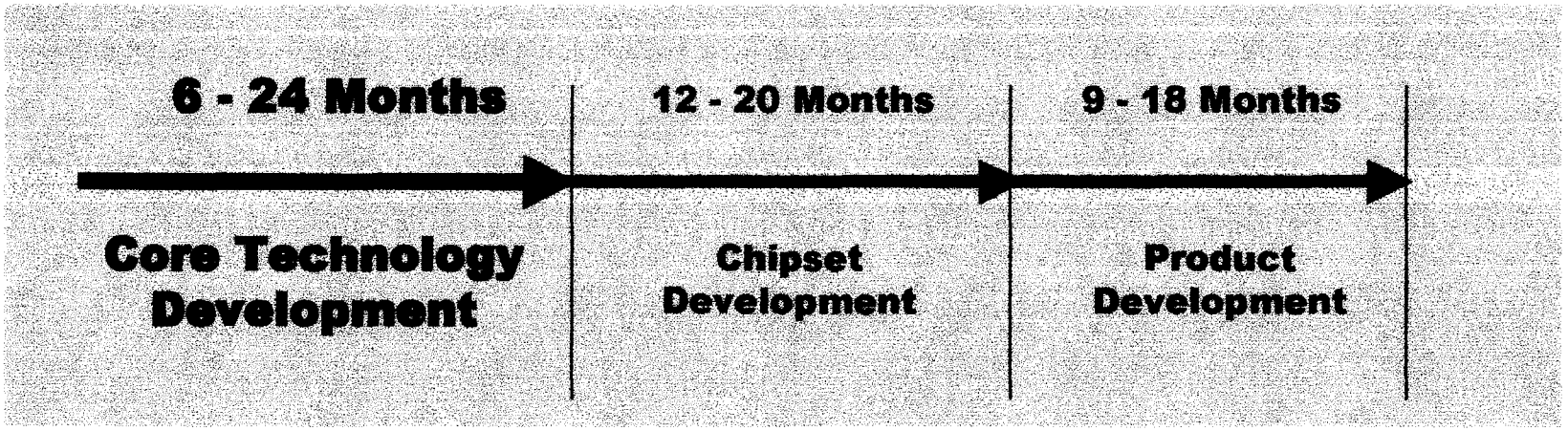
Paul DeClerck
Principal Staff Engineer
Personal Communications Sector Research Labs

Audrey Longhurst
Principal Staff Engineer
iDEN Subscriber Division

Discussion Topics

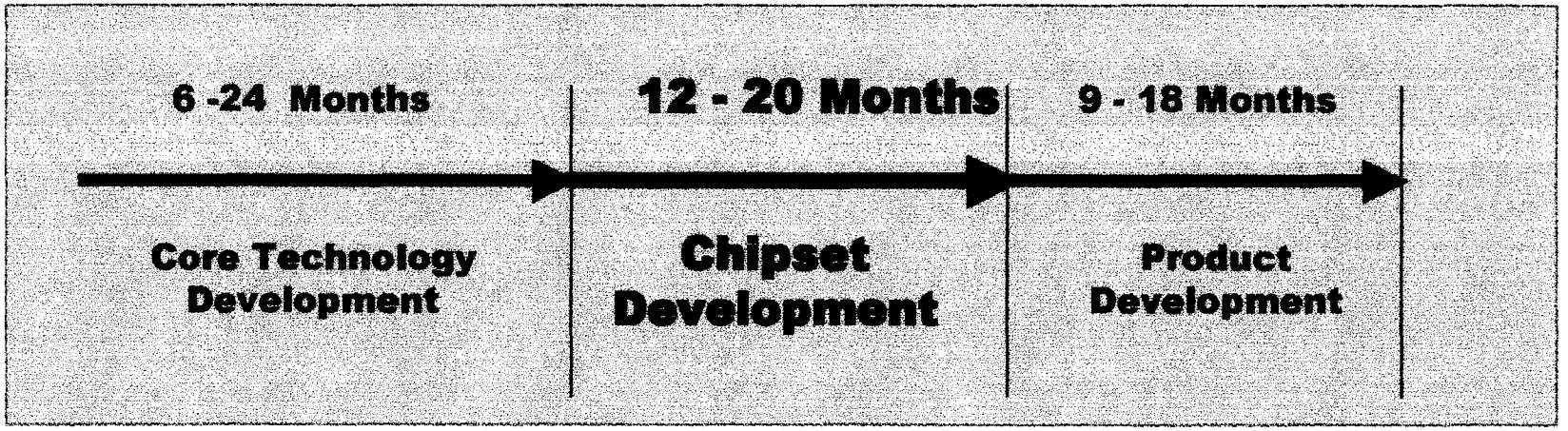
- **Description of Development Process**
  - **Make/Buy Decisions**
- **Survey of Location Technology Options**
  - **Field Test Results**
- **Summary and Discussion**

Development Process



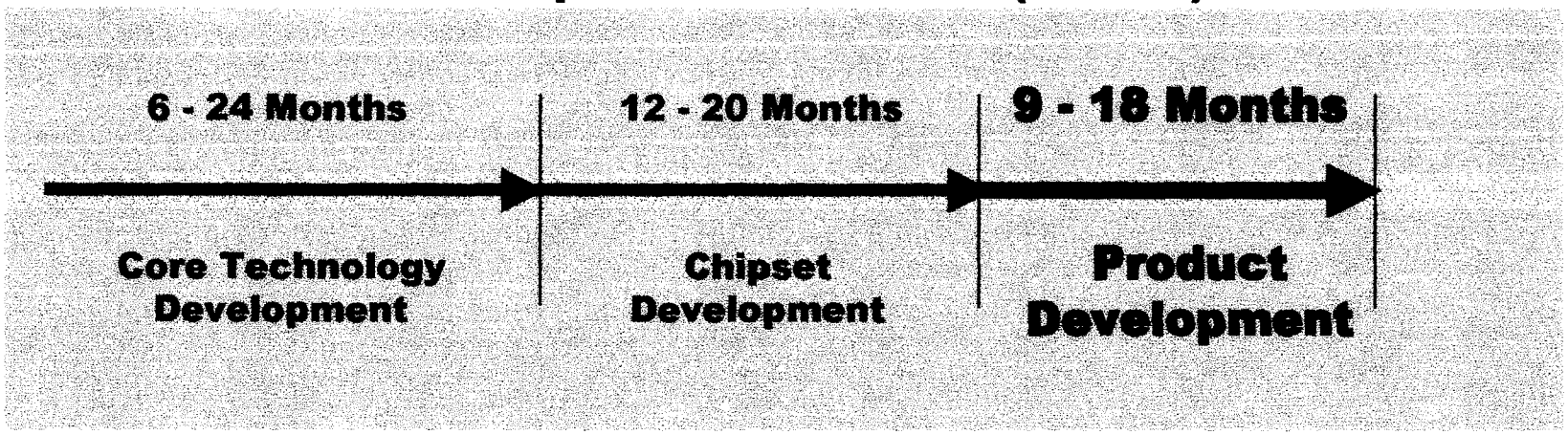
- **Core Technology Development Phase** (Applied Research)
  - Define Core Product Architecture
    - Partition Functionality Among Chips and SW Modules
  - Design Software Algorithms
  - Design Hardware Subsystems
    - Cellular Transmitter, Cellular Receiver, GPS Receiver, etc.

Development Process (cont..)



- **Chipset and Software Development Phase**
  - Design and Verify Hardware Blocks
  - Integrate Blocks into Full Chip Design
  - Design and Verify Software Blocks
  - Low Level Integration of Software Blocks

Development Process (cont..)



- **Product Development Phase**
  - Integration of Subsystems (Hardware and Software)
  - Spec Conformance Testing
    - Type Approval
    - System Interoperability
  - Quality Testing
  - Manufacturing Ramp Up
    - Improve Manufacturing Yield
    - Ramp Up Component Suppliers

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Product Value

- A Product is More than a Collection of Physical Pieces
- Intellectual Value Is Also Embedded in Design of Building Blocks
- But, Products Are Worth LESS in the Market than the Sum of the Building Blocks if Purchased Individually.
- Manufacturers Can Add Significant Intellectual Value In:
  - Core Technology **(Greatest Value)**
  - Chipset and Software
  - Styling and User Interface
  - Manufacturing Know-How (Efficiency) **(Least)**

"Make/Buy" Decision Factors

- We Need to Develop Flexible Products that Meet Global Requirements.
- Including Products for Multiple Cellular Standards
  - GSM, CDMA, "TDMA", iDEN (Singly and Combos)
- Reuse of Common Subsystems (including Location) Across All Our Products Is Important for Design Efficiency, and
- This Minimizes Product Cost, Leading to:
  - Enhanced Competition
  - Lowest Cost to the Consumer

- Our Ability to Deliver Lowest Cost Products to the Consumer, Depends on the Use of Our Own Core Technology and Chipset Implementations.

Overview of Location Technology Options

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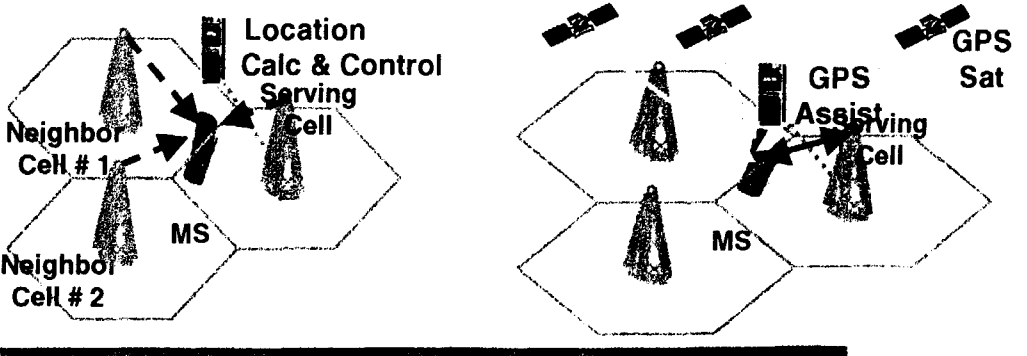
Location Technologies

	Network-Based	Handset Based: AFLT/EOTD	Handset Based Assisted-GPS
Methods	AOA, TDOA, Cell ID, Finger printing, etc.	AFLT – CDMA EOTD – GSM/iDEN	Combination of Network & Satellite
Base-Station Modification	New Equipment	Network Interface & New Equipment	Network Interface
Handset Modification	Minimal	Firmware + Memory	Radio Receiver: RF, Baseband, Memory, Firmware, Separate Antenna
Handset Added Cost	Minimal	Low	High
Accuracy (Approximate)	~ 50-500 m	50-300 m	10-150 m



ALI Feasible Implementation Plan For Handsets

1) **AFLT**$_{(CDMA)}$/**EOTD**$_{(GSM/iDEN)}$
- Faster time to provide ALI Capability to Consumers.
- Firmware Modification, Minimal Hardware Changes
- Low Cost, Complexity, and Battery Impact on Handset.
- Limited Accuracy

2) **A-GPS**
- Longer Time to Develop a Cost Effective Solution
- Hardware + Firmware Modification
- High Cost, Size, Battery Impact on Handset.
- Better Accuracy

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A-GPS Product Development Plan

- **Short Term: Non-Integrated Chipset**
  - **Accessory** (External Accessory Module - Battery Pack)
    - Cost Prohibitive
    - Commercially Not feasible as a Required Module
    - Optional Module for added value
  - **Internal Module**
    - High Cost & Complexity
    - Higher Current Drain
    - Larger Phone
- **Long Term: Integrated Chipset**
  - Integrate A-GPS in Radio Receiver Chip Set IC's
  - Cost Effective Solution
  - Meets Size and Power Expectations

A-GPS Development & Handset Impacts

	1H02 Short Term: Accessory	2H02 Short Term: Internal Module	1H03 Long Term: Chip Integration
Phone Implementation			
Hardware IC			
Software			
Relative Added Cost (low-tier products)			
Battery Life Degradation			
Size Impact			
Commercially Acceptable			

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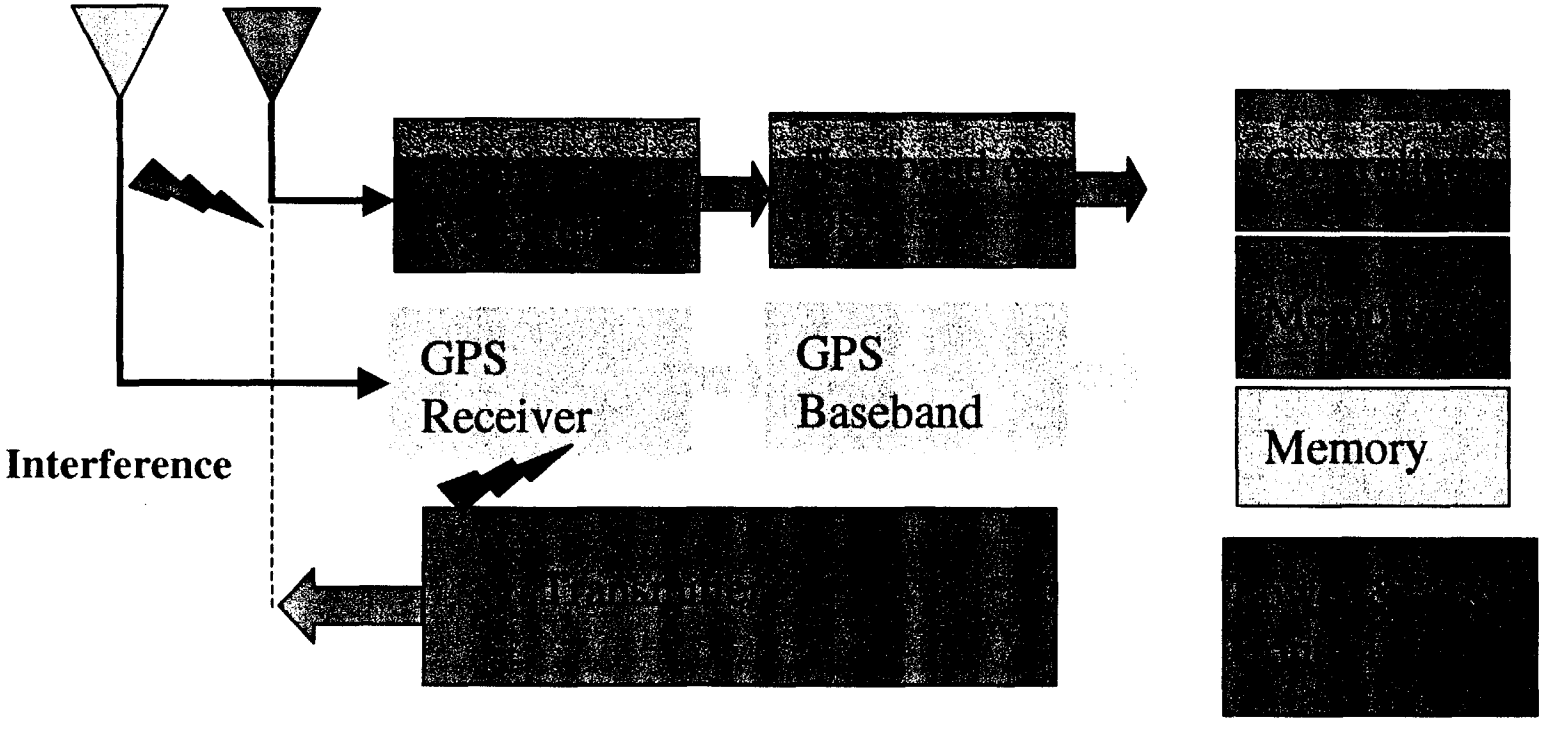
Results of Field Tests

Typical Handset IC Chip-Set + GPS IC's



- Issues with Non-Integrated Chipset Solution
  - Re-Design Radio Architecture, Interface, Clocking, Signaling, etc.
  - Development time and software investment is lengthy -- Not optimized for Motorola Architecture, Re-use Limited.
  - High Cost (IC cost + Royalties) & Complexity
  - Inefficient in terms of performance, battery life, etc.

Results Of Location Testing

Technology	Conditions	Results	Company	Date	Location
Assisted GPS (A-GPS)	Urban (Low Buildings) Indoor, Suburban	Acceptable for open env. and in-vehicle	Qcom, STCTG, Motorola	4/99	Tampa (GTE and Sprint)
	Dense urban (Urban Canyons)	Multi-Path, Weak Signal, Error >100 m	Motorola	5/99	Chicago
	Indoor	Fails if more than 5 m inside building	Motorola	6/99	Phoenix
	Urban, Indoor, Suburban	TBD	Qcom, STGTG, Motorola	7/00	Paris (France Telecom)
E-OTD	Urban	240 m @67% Does not meet FCC spec.	Motorola	'98	Swindon
	Suburban (3 sites)	>200 m Does not meet FCC Spec.	Motorola	8/99	Chicago
	Urban, Indoor, Suburban (10 sites)	Results Not yet Available	Nextel, Motorola	5/00	Washington D.C.
A-FLT	Outdoor	>150 m Does not meet FCC spec.	Motorola	'99	Israel

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Assisted GPS Field Test Summary

- Skyscraper Canyons and In Buildings were most challenging environments.
- Obtaining fixes inside an automobile was satisfactory independent of phone position.
- In most instances there was difficulty obtaining fixes indoors regardless of phone position.

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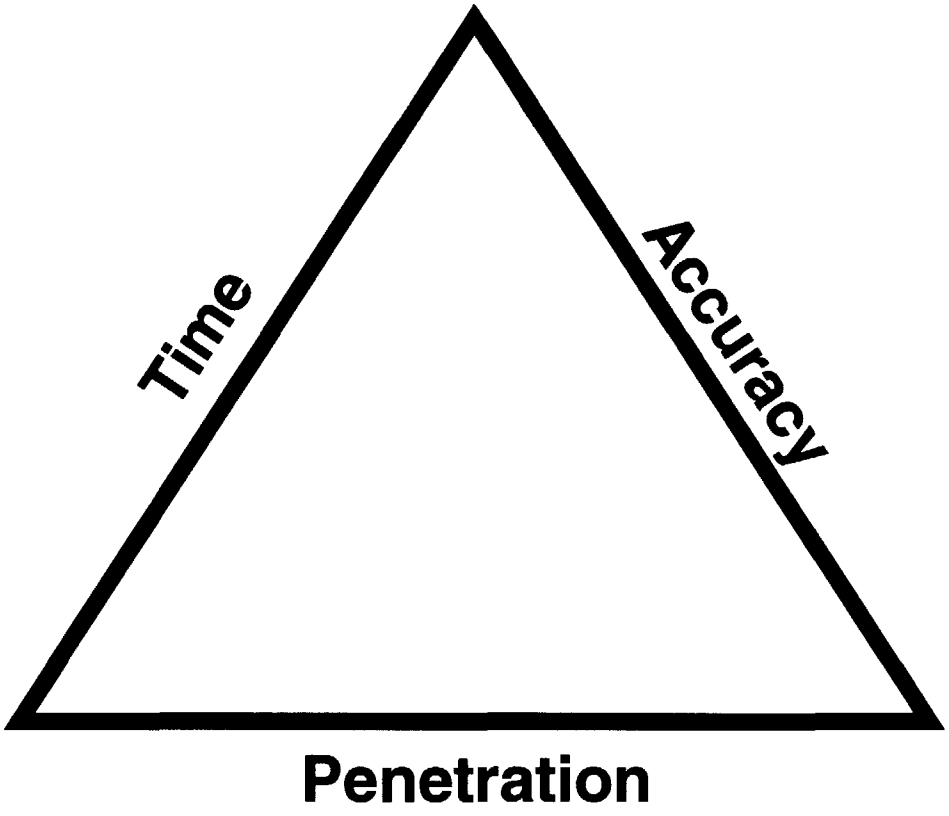
Summary

The Location "Trilemma"



- The Current Requirements for Accuracy, Timing and Penetration Cannot Be Met Simultaneously With Handset Based Solutions

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Conclusions

- Testing of location technology has not provided conclusive data, upon which operators can make a sound decision.
- AFLT and EOTD don't meet current Phase 2 accuracy requirements for handset based implementations.
- Assisted GPS has problems with in-building coverage and on the street near tall buildings.
- With no handset based solution able to meet current requirements, the technology decision becomes heavily weighted in favor of network based solution.
- Manufacturers need an early decision to prepare for deployment of products in high volume.

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Recommendation

- The FCC's support for the benefits of technology neutrality suggests it is desirable to re-balance the network based and handset based requirements.
  - Time
  - Accuracy
  - Penetration